4.7 Geology/Soils

The following summarizes the results of the *Limited Geotechnical Evaluation Grantville Redevelopment Project Environmental Impact Report (EIR), San Diego, California* (Ninyo & Moore, September 17, 2004). The complete report is provided in Volume II, Appendix G of this EIR.

4.7.1 Existing Conditions

The Project Area is located in the western portion of the Peninsular Ranges Geomorphic Province of Southern California. The Peninsular Ranges are traversed by several major active faults including the Whittier-Elsinore, and San Jacinto faults located northeast of the Project Area and the Rose Canyon, Agua Blanca-Coronado Bank and San Clemente faults located west of the Project Area.

4.7.1.1 Geology

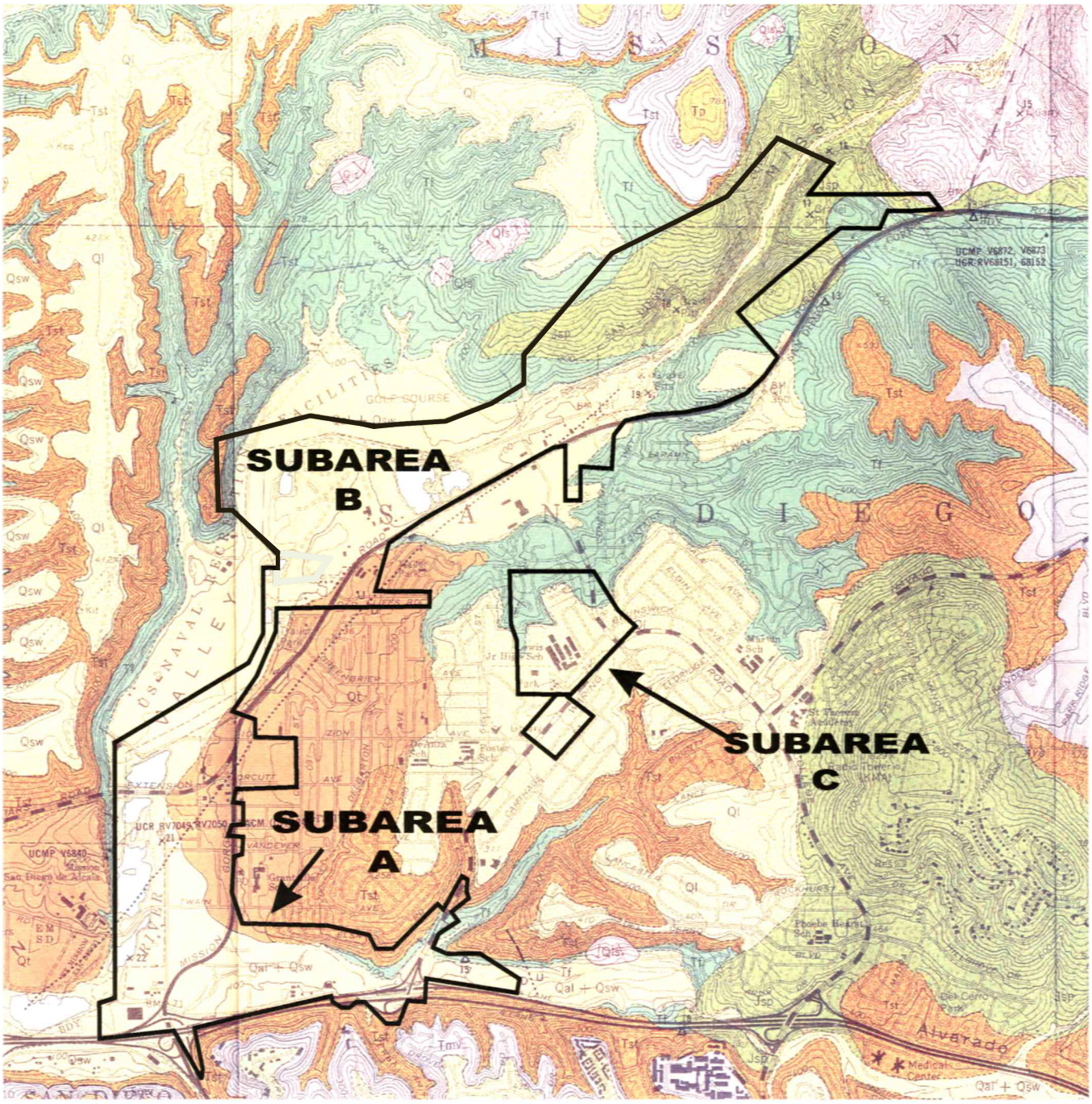
The Project Area is generally underlain by fill associated with the development of individual parcels, alluvium (along the San Diego River and Alvarado Canyon north of I-8), terrace deposits (along the eastern side of Subarea A), Lindavista Formation (Subarea C), Stadium Conglomerate (Subarea A, northside of Alvarado Canyon), Friars Formation (the eastern end of Subarea B and north central portion of Subarea C), and the Santiago Peak Volcanics (eastern end of Subarea B). Figure 4.7-1 depicts the soils and geologic units in the Project Area. The units are described below:

Fill (not mapped): Fill soils in the Project Area are generally derived from nearby formational units and are similar in composition. Fill soils can vary from clay to sand, depending on the parent material. The compaction of the fills can vary considerably, ranging from loose to dense. Fill soils are located in Subareas A, B, and C.

Alluvium and Slopewash (map symbol Qal + sw): Holocene alluvium is present in the bottom of the San Diego River Valley and Alvarado Canyon north of I-8 (Subareas A and B). The alluvium generally consists of silty sand and clayey sand with some clay and silt. Scattered layers of gravel and cobbles are also likely to be present within the alluvium. The alluvium is generally in a loose condition and much of it would be subject to liquefaction below the water table. In developed parts of the western portion of Subarea A, alluvium is likely to be present below existing fill soils.

Terrace Deposits (map symbol Qt): Pleistocene age terrace deposits have been mapped on portions of Subarea A. In general, the terrace deposits consist of medium dense, coarse silty to poorly graded sand.

Lindavista Formation (map symbol Ql): The Pleistocene Lindavista Formation has been mapped on Subarea C. In general, materials of the Lindavista Formation consist of brown to reddish brown, weakly to moderately cemented, clayey and silty sandstone. Strongly cemented concentrations are also commonly found within the Lindavista Formation.



SOURCE: Ninyo & Moore, 2004

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Geologic Map

FIGURE

4.7-1

Stadium Conglomerate (map symbol Tst): The late Eocene-age Stadium Conglomerate has been mapped in the eastern portion of Subarea A on the north side of Alvarado Canyon. In general, the Stadium Conglomerate consists of cobbles with a moderately cemented, coarse-grained sandstone matrix.

Friars Formation (map symbol Tf): The middle Eocene-age Friars Formation has been mapped in the eastern portion of Subarea A on the north side of Alvarado Canyon and in Subarea B on the south side of Mission Gorge. In general, the Friars Formation consists of massive, medium-grained sandstone with interbreds of strongly indurated claystone. The claystone is generally moderately to highly expansive. Cobble conglomerate lenses are also common within the Friars Formation.

Santiago Peak Volcanics (map symbol Jsp): The Jurassic, Santiago Peak Volcanics are present in the eastern portion of Subarea B on the northeastern and southern sides of Mission Gorge. In general, the Santiago Peak Volcanics consist of metamorphosed volcanic, volcaniclastic, and sedimentary rocks. In the Project Area, materials of the Santiago Peak Volcanics are being mined for aggregate.

4.7.1.2 Mineral Resources

The majority of the Project Area is located within urban areas where no significant mineral deposits are present, or are considered likely to exist. Therefore, the potential for loss of mineral deposits due to further development in these portions of the Project Area is considered low.

4.7.1.3 Groundwater

Based on the project location, groundwater is likely to be at or near the surface in the bottom of the San Diego River Valley. Groundwater is expected to be at depths of 20 to 40 feet below the majority of Subarea A and lower portions of Subarea B. In the higher elevations of the Project Area (portions of Subarea B and C) depths to groundwater are expected to be more than 50 feet. Groundwater levels can fluctuate due to seasonal variations, irrigation, and other factors. The majority of the Project Area is not expected to be affected by shallow groundwater.

4.7.1.4 Geotechnical Hazards

A. Slope Stability

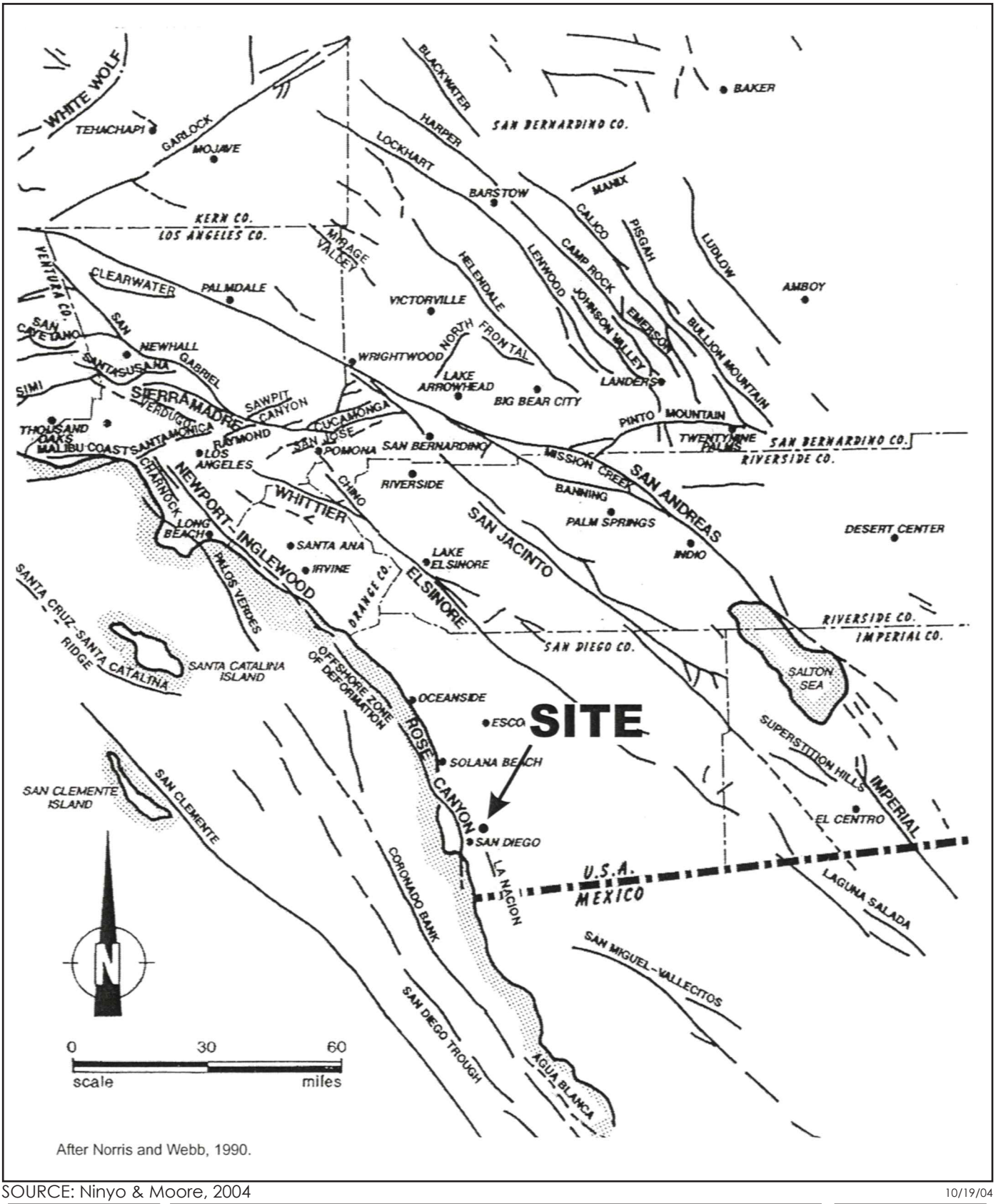
No landslides or indications of deep-seated landslides were mapped or observed in the Project Area.

B. Faulting and Seismicity

The Project Area is located in a seismically active area, as is most of Southern California. The Project Area is not underlain by known active faults (i.e., faults that exhibit evidence of ground displacement during the last 11,000 years).

Active Faults

No faults currently classified as "active" by the State of California are known to traverse the Project Area. The Rose Canyon fault is the closest "active" fault located approximately five miles west of the Project Area. The fault lies within an Earthquake Fault Zone (Figure 4.7-2).



SOURCE: Ninyo & Moore, 2004

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Fault Location Map

FIGURE

4.7-2

Strong Ground Motion and Ground Surface Rupture

The seismic hazard most likely to impact the Project Area is ground shaking resulting from an earthquake on a major active fault. Due to the relatively close proximity of the Rose Canyon Fault Zone to the Project Area, the most significant ground shaking from one of the regional faults will most likely occur on the Rose Canyon Fault Zone. The Project Area is located in a zone where the horizontal peak ground acceleration having a 10 percent probability of exceedance in 50 years is 0.25g (25 percent of the acceleration of gravity). A maximum credible earthquake of magnitude 6.9 on the Rose Canyon Fault Zone could produce a peak horizontal ground acceleration of 0.31g to 0.36g (site acceleration), and a maximum probably event may be on the order of 0.17g to 0.19g. This is the level of risk assumed by the Uniform Building Code (UBC, 1997) minimum design requirements.

4.7.2 Impact Threshold

For the purposes of this EIR, a significant impact would occur if the proposed project would:

- *Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:*
  - *i. Rupture of a known earthquake fault as delineated on the most recent Alquist-Priolo Earthquake Fault Zone Map;*
  - *ii. Strong seismic ground shaking;*
  - *iii Seismic-related ground failure, including liquefaction; or*
  - *iv Landslides.*
- *Result in substantial soil erosion or loss of topsoil;*
- *Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse;*
- *Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code; or,*
- *Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewer are not available for the disposal of waste water.*

4.7.3 Impact

4.7.3.1 Groundwater

Perched water conditions due to irrigation and runoff may be encountered in portions of the Project Area. The majority of the Project Area is not expected to be affected by shallow groundwater. However, groundwater is likely to be at or near the surface in the bottom of the San Diego River Valley. Any future redevelopment activities in or near the River Valley would need to account for the potential for groundwater. The potential presence of groundwater is considered a significant impact.

4.7.3.2 Geotechnical Hazards

A. Slope Stability

There are no landslides or deep-seated landslides located within the Project Area and no impact associated with this issue is anticipated.

B. Faulting and Seismicity

The Project Area is located in a seismically active area, as is most of Southern California. No active faults traverse the Project Area. The closest active fault to the Project Area is the Rose Canyon Fault, which is assigned a maximum earthquake magnitude of 6.9. The impact associated with faulting and seismicity is considered significant as implementation of future redevelopment activities has the potential to expose people or structures to potential substantial adverse effects due to strong ground shaking or seismic related ground failure. Implementation of Mitigation Measure GS1 will reduce the impact to a level less than significant.

Ground surface rupture due to active faulting is not considered likely due to the absence of known active faults underlying the Project Area. Lurching and cracking of the ground as a result of nearby or distant seismic events is also considered unlikely.

Liquefaction, Seismically Induced Settlement and Lateral Spread

Liquefaction of cohesionless soils can be caused by strong vibratory motion due to earthquakes. Loose granular soils and non-plastic silts that are saturated by a relatively shallow groundwater table are most susceptible to liquefaction. The Project Area contains some areas that may be subject to liquefaction in the event of a nearby seismic event. These areas include the lower portions of Subareas A and B. The impact associated with liquefaction, induce settlement and lateral spread is considered significant. Implementation of Mitigation Measure GS1 will reduce the impact to a level less than significant.

Soil Erosion

Implementation of future redevelopment activities is not anticipated to result in substantial soil erosion. The Project Area is primarily developed, and redevelopment activities will need to comply with storm water regulations that require implementation of erosion control measures during construction of a project. While the Project Area is large, redevelopment of the area will occur over a 20 to 30 year period. Any active construction activity in the Redevelopment Project Area at any one time would not be significant in terms of the amount of soils exposed to erosion forces such as wind and rain.

Septic Systems

The Project Area is served by a municipal sewer system and does not rely on septic systems for disposal. As such, no impact associated with soils incapable of adequately supporting the use of septic tanks will result.

4.7.4 Significance of Impact

Existing geotechnical conditions of the Project Area related to the potential presence of near surface groundwater, ground shaking during a seismic event, and liquefaction is considered a significant geotechnical condition that may impact future development. As future development activities are proposed within the Project Area, a site specific geotechnical evaluation will need to be conducted for each project to identify the specific geotechnical conditions of the site and measures that would need to be implemented in order to address potential site constraints.

4.7.5 Mitigation Measures

GS1 A comprehensive geotechnical evaluation, including development-specific surface exploration and laboratory testing, shall be conducted prior to design and construction of any development within the Project Area. The purpose of the subsurface evaluation would be to: 1) further evaluate the subsurface conditions in the area of future structures or improvements; and, 2) provide information pertaining to the engineering characteristics of earth materials of each development. From these data, recommendations for grading, earthwork, surface and subsurface drainage, foundations, pavement structural sections, sedimentation mitigation, and other pertinent geotechnical design considerations may be formulated.

The Rose Canyon fault has been mapped approximately five miles to the west of the site. Accordingly, the site has a potential for moderate ground motions due to an earthquake on the active Rose Canyon fault. Therefore, the potential for moderate seismic accelerations will need to be considered in the design of future structures or improvements. The level of risk associated with these seismic accelerations is the level of risk assumed by the UBC minimum design requirements.

The settlement of potential underlain fill soils will likely require that multi-level structures be supported on deep foundations. The settlement potential of these soils would be evaluated as part of the geotechnical design phase of any redevelopment activity. Measures may include removal of these soils and replacement with compacted fill.

Lower portions of Subareas A and B are underlain by alluvium which may be subject to liquefaction. Mitigation may include removal of loose alluvium and replacement with compacted fill or supporting any future structures on deep foundations which extend through the alluvium.

4.7.6 Conclusion

Implementation of Mitigation Measure GS1 will reduce the impact to geology and soils to a level of less than significant.

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